

ABSTRACT OF THE DISCLOSURE

A harmonic cantilever for use in a tapping-mode atomic force microscope includes a cantilever arm and a probe tip. The cantilever arm has a shape selected to tune the fundamental resonance frequency or a resonance frequency of a selected higher order mode so that the fundamental and higher-order resonance frequencies have an integer ratio or near integer ratio. In one embodiment, the cantilever arm can be shaped to tune the fundamental resonance frequency. Alternately, the cantilever arm can include a geometric feature for tuning the resonance frequency of the fundamental mode or the selected higher order mode. An imaging method using the harmonic cantilever is disclosed whereby signals at the higher harmonics are measured to determine the material properties of a sample. In other embodiment, a cantilever includes a probe tip positioned at a location of minimum displacement of unwanted harmonics for suppressing signals associated with the unwanted harmonics.